

# TECHNICAL REPORT

**Contract Title:** Infrared Algorithm Development for  
Ocean Observations with EOS/MODIS  
**Contract:** NAS5-31361  
**Type of Report:** SEMIANNUAL  
**Time Period:** JUNE, 1993  
**Principal Investigator:**  
Otis B. Brown  
RSMAS/MPO  
University of Miami  
4600 Rickenbacker Causeway  
Miami, Florida 33149-1098

---

## MODIS INFRARED ALGORITHM DEVELOPMENT

### A. Near-Term Objectives

- A.1 Continue interaction with the MODIS Instrument Team through meetings and electronic communications.
- A.2 Continue algorithmic development efforts based on experimental match-up databases and radiative transfer models.
- A.3 Complete 1988 extractions for global in situ drifting buoy validation database.
- A.4 Complete infrared SST algorithm document for peer review.
- A.5 Continue evaluation of different approaches for global SST data assimilation and work on statistically based objective analysis approaches.
- A.6 Continue evaluation of high-speed network interconnection technologies with preliminary foci on ATM and LEC toll options.
- A.7 Provide investigator and staff support for the preceding items.

## **B. Overview of Current Progress**

### **B.1 Activities**

#### **B.1.1 JANUARY THROUGH MARCH**

**B.1.1.1** Continue discussions with DEC concerning use of their GIGASWITCH hub for FDDI and ATM interconnections.

Multiple discussions with representatives of DEC were held concerning beta field test of their GIGASWITCH hub. Our expectation is that this unit can be upgraded to work with ATM connections. The initial implementation of the GIGASWITCH will permit improvement of work station connectivity at Miami using FDDI connectivity. The principal impact of these improvements should be in accessing of distributed database holding. DEC has agreed in principle to provide Miami with a test unit during the next quarter.

**B.1.1.2.** Finalize arrangements with FORE concerning use of their hub for ATM interconnections.

NRL/ARPA proposes that we use FORE ATM switches as a basis for the proposed ARPA wide area network experiments. We have discussed the potential implementation with FORE and they visited Miami and described the current and projected capabilities over the next year. It appears that these switches are reliable basis for a wide area computer data network, however, our current view is that they would not work well for a multi-media network. NRL has ordered a 4 port switch module and several workstation interfaces for our evaluation. We expect installation in late July.

**B.1.1.3** Continue discussions with NEWBRIDGE and University telecommunications concerning use of NEWBRIDGE hub for ATM interconnections.

Our product review activities for high speed networking have included a number of different vendors. NEWBRIDGE was chosen as representative of a high performance switch that would permit diverse multi-media applications as well as computer data networking using ATM switching technology. We have involved the University of Miami Telecommunications in this discussion

because it has the potential of facilitating University infrastructure for links between H. Gordon's MODIS efforts in the Physics Department and the Brown and Evans' efforts at RSMAS. The University is currently studying issues involved with implementation of DS-3 links between the campuses. NEWBRIDGE is scheduled for a second visit on July 9. At this time we will evaluate the feasibility of an inter operability test with the previously mentioned FORE switch.

B.1.2.4 Initiate discussions with GENERAL DATA COMM concerning use of their ATM hub for WAN applications.

A number of telephone exchanges were held with local and national GENERAL DATA COMM sales and technical staff. These exchanges culminated in an all day briefing by national technical support staff to University of Miami MODIS and telecommunications representatives on June 8, 1993. Pertinent action items are: GDC will determine availability and functionality of T3 interfaces, UM will go forward with establishing FORE based local area ATM network, UM will negotiate with Southern Bell for a DS-3 link between Virginia Key and Coral Gables campuses, and GDC and UM will continue discussions on an intercampus field test of integrated data, video and voice networking using ATM technology between the Virginia Key and Coral Gables campuses.

B.1.2.5 Extend DEC/ALPHA field test interval.

We negotiated an extension of the Decsystem 7000/610 departmental server in order to test DECnet/OSI in the OSF/1 operating system environment. Also Digital has agreed to provide a FUTUREbus based FDDI controller for this system for evaluation. Combination of these two products should dramatically improve file server performance of the configuration. Later in the year we are planning to field test the OSF/1 implementation of the AFS as an additional route to improving server performance.

B.1.1.6 Purchase of workstations for algorithm development.

Two workstation purchases (DECstation 3000/400) were initiated and completed. Also, a third purchase (DECstation 3000/500) was initiated and approved by NASA/GSFC for purchase. The DECstation 3000/400 workstations will be used for analysis and visualization activities associated with algorithm development

while the DECstation 3000/500 will be initially configured as a backup file server for the 7000/610. Primary use of the file servers is for algorithm development and evaluation.

B.1.1.7 Hire new scientist to focus on comparison database development and algorithm testing.

A search opened in late 1992 was completed for a post doctoral fellow to assist in algorithm development. Dr. Satheesh Shenoi (NIO, Goa) has been hired and reported to work in early April. His initial efforts since his arrival in April have focused on learning the algorithm development, test and evaluation environment by working on various analyses of NOAA AVHRR and drifting buoy comparison datasets.

B.1.1.8 Generation of MIAMI and NOAA non-linearity correction based match-up datasets for local and community evaluation.

The MIAMI and NOAA non-linearity corrections are being used to generate large scale global datasets for comparison and evaluation purposes. This activity was started and complete for the initial evaluation dataset. The comparison dataset has been sent to the NASA/JPL Ocean DAAC for distribution to various PATHFINDER participants (See Evans report for more details).

B.1.1.7 Respond to requests from MODIS Project concerning infrared band dual-use issues.

The MODIS Project, in its continuing discussions with Hughes/SBRC, and the instrument team, is seeking to maximize MODIS instrument performance at minimal cost. Thus, the Project considered dual use of infrared bands for SST, and terrestrial fire and volcanism. While this appears to be a valid approach at the outset, without re-engineering of electronics on the sensor, it does not appear that NEDTs required for SST applications can be sustained with a single dynamic range usable for the terrestrial applications. In the absence of a bi-linear approach that maintains the needed precision and accuracies for SST retrieval, the investigator recommends against this approach.

B.1.2.8 Non-linear calibration paper is accepted by Journal of Geophysical Research.

B.1.2.9 'Non-linear calibration paper' returned to Journal of Geophysical Research for publication.

The editor of JGR accepted a revised draft of the non-linear calibration paper for NOAA/AVHRR instruments by James Brown, Otis Brown and Robert Evans in early June. This paper, as reported last year, develops a new approach for such corrections which permits extrapolation of non-linear corrections over a wider instrument temperature operating envelop with higher accuracies (~0.1 K RMS, *i.e.* a least-bit-count).

B.1.2.10 Evaluate scattered radiance fixes in SeaWiFS and implications for MODIS.

It became clear during early 1993 that the SeaWiFS visible radiometer has degraded performance apparently due to scattered light which is inherent to the design. Thus there is wide spread concern that similar anomalous radiance can be expected to be found in MODIS. This issue seems to principally affect the visible performance and is not considered to be a significant problem for the mid- and far-infrared bands.

B.1.2.11 Initiate SST Algorithm description for Project

The Project requires a formal definition of the infrared SST algorithm for peer review, documentation of the approach, configuration control and implementation. Efforts were started in the second quarter to complete the history, physical approach and implementation sections. Our goal remains to complete the document by late July.

## **B.2. Investigator Support**

### **B.2.1 JANUARY through JUNE**

B.2.1.1 O. Brown - Team related effort

B.2.1.2 G. Halliwell - Analyses efforts

B.2.1.3 S. Shenoi - Database and modeling efforts (April-June)

## **C. Future Activities**

### **C.1 Algorithms**

## **C.1 Algorithms**

- C.1.1 Finalize algorithm description document for Project.
- C.1.2 Continue to develop and test algorithms on global retrievals.
- C.1.3 Evaluation of global data assimilation statistics for SST.
- C.1.4 Configure and utilize various AFCRL transmission codes.
- C.1.5 Implement ATM based network test bed.
- C.1.6 Integrated new 100 Specmark+ workstations into algorithm development environment.

## **C.2 Investigator support - Continue current efforts.**

## **D. Problems**

No new problems to report.